MARKET FORECASTS AND COST ECONOMICS STRUCTURES FOR THE MANAGEMENT OF CIVIL AIRCRAFT OPERATIONS IN INDIA

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Abstract

The Indian aviation scene is presently witness to growth that has not been seen before, while consolidation by mergers and acquisition has also commenced to ensure viability. This growth has been driven by fundamental structural changes in the economy, low cost airlines and dynamic yield management. There has been opportunity to monitor the changing structure of the civil aviation industry over the past decade. NAL, as part of its civil aviation programme, initiated market evaluation studies which also provided insight into demand, price elasticity and development of airline networks. Studies conducted also included work on the regulation regime transformation and case studies on the failures of the airlines in the last decade. This paper summarizes the work and presents new forecasts for the next twenty years, through which we can identify the need to develop new generation aircraft suitable to India and the requirement for cohesive vertical integration required to make the industry viable and a wealth creator in the long term.

1.0 Introduction

The Indian economy is presently growing at over 9% and a simple relationship between GDP growth and air traffic which is about 2.5 times was exceeded in 2006-07 with a staggering 45% growth. While, this particular year may have seen a coincidence of economic growth as well as intense competition leading to lowering of prices despite fuel price increase, it is possible that double digit growth rates for Indian air traffic for the next few years is now a reality. There appear to be severe infrastructure problems, lack of adequate vertical integration, viability issues etc that will hamper growth prospects. The Indian traffic scene is highly stratified and except for the major metros, Bangalore and Hyderabad, the concept of “inclusive growth” advocated by the Government may not occur if the Tier I and Tier II cities are not connected. The regulatory regime has distinctly become friendlier and taxation is no longer an entry barrier.

However, cost structures are driven by high ownership costs, fuel costs and maintenance costs leading to losses in the industry.

The Indian demographic and economic geography presents interesting opportunities for the growth of civil aviation based on affluence pockets spread all through the sub- continent. Airports, especially airfields are spread across the country. Hubs at the major metros which are over 1000 kms apart provide possibilities of hub spoke arrangements. The rather seamless interactions between regions provide strong city pairs and hence opportunities for smaller regional and commuter aircraft. Initial work on networks, show the need for a *fleet mix*.

Methodology to predict the requirements was also explored during the course of work done at NAL. These included city pair analysis, analysis of demography and economics of individual cities, urbanisation etc and development of econometric models using econometric indicators. Since 2003, after the introduction of the low cost airline paradigm, much of these models have had to be reworked as yield sensitivity was found to be important and the large contribution of the services sector to economic growth has occurred.

Cost structures in the industry which were driven by taxation at the ticketing level, fuel taxation (including sales tax) have been rationalised. The Naresh Chandra Committee report has been instrumental in bringing about these changes. However, the industry is driven by high ownership costs (due to near complete import of aircraft and spares), maintenance costs due to aircraft being maintained abroad and fuel costs where fuel taxation and lack of hedging have contributed to carriers incurring higher overall cost. Between 1993-2000, a number of airlines commenced operations, out of which just three survived. It was found from our studies that many of these airlines did not have the management skills or the required capital to survive. For example, Gujarat Airways proceeded on an unbridled expansion in operations leading to reliability problems and spiralling costs. Interestingly, Air Deccan's expansion strategy also appears to have led to a similar situation.

More recently, a market forecast for civil aircraft was made while studies on the possibilities of setting up Maintenance, Repair and Overhaul (MRO) in India were being conducted. Irrespective of the

present lack of viability in some parts of the industry, it was found that due to the growth prospects, India would require over 1000 aircraft by 2020. It was found that only by vertical integration in the form of developing risk sharing partnerships for manufacture of spares and components, development of a local MRO base and use of appropriate supply chain framework, the viability of local operations would be ensured.

2.0 Air traffic markets

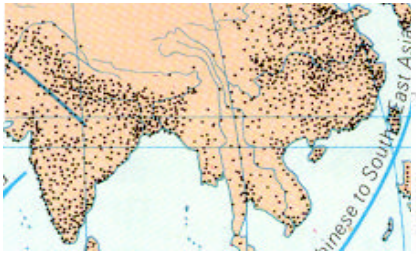


Fig. 1a Population distribution (India, China)*

*-Phillips Wold Atlas

Fig. 1b. Affluence pockets in India$

$-CII-NCAER Report on civil aviation, 2000

Air traffic markets are influenced by demography, urbanisation, affluence levels and location of industrial and business activity. Fig. 1 shows that India has a more even distribution of population than China, which has a concentration of economic activity on its eastern sea board and the population is sparse in the North-Western region. Fig. 1b shows the CII-NCAER study which shows that affluent pockets are also spread across the country, though higher level of affluence exists in the South-Western regions. In general, the use of aviation is driven by a demand pyramid with premium services at the higher level and low cost services at the bottom of the pyramid. However, new work by management guru C K Prahalad is that that shape is now in the form of a diamond. Over the next decade, a large part of the low-income class is expected to become part of the middle class. Today, estimates of India's middle class population vary from 350 to 400 million. There appears much evidence to support this based on the disposable incomes being generated by the services sector.

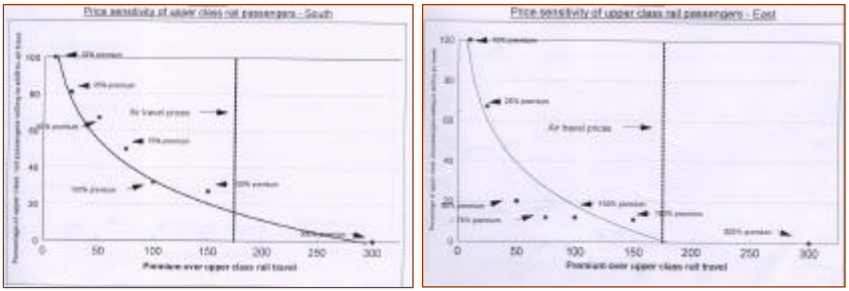


Fig. 2. Price sensitivity studies

In 1999-2000, NAL carried out studies to estimate price sensitivity across regions for air travel and possibilities of modal shifts: passengers from rail and road shifting to air, if provided with reliable services, and a typical example is shown in Fig. 2.

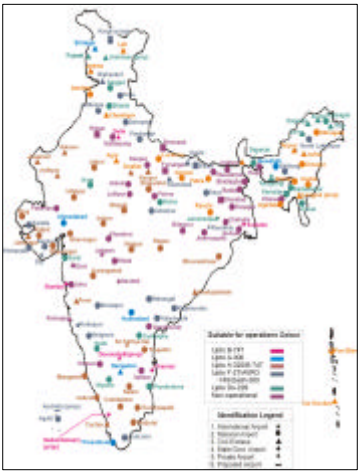


Fig. 3. Airfields in India

Fig. 3 shows a list of airfields/airports also spread across the country. Though, a large number of them are presently non-functional, opportunities exist to study if they can be revived and linked to urban centres based on viability and a good indication of sustained traffic. However, developing forecasts for urban centres like the metros and

cities which have larger urbanisation and having air-links is comparatively easier as past trends are available. Though, the rapidly changing economy means that many of the cities that were not on the airmap could generate demand for airports. New work to ascertain these is required.

The Indian air traffic market is highly stratified, with Mumbai and Delhi at one stage accounting for more than 70% traffic. Traffic out of the main cities appear to justify A320, B737 class of aircraft compared to smaller towns which require regional aircraft or commuter aircraft. The following table shows a typical system load factor for the year 2003 and 2001 census. It must be noted that Goa (Panaji) has a higher load factor due to the tourist inflow, though its population to traffic ratio is high. Agartala, poorly connected with the mainland by surface transport is also another candidate.

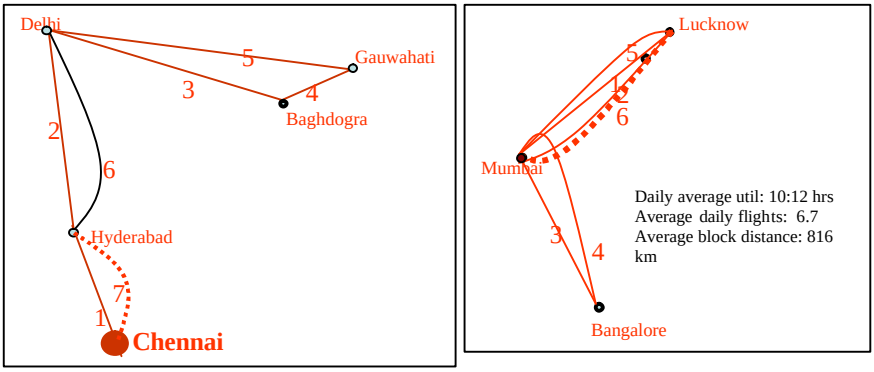
Table 1.

Sl. No.	City	Region	Passenger traffic / aircraft movement	Air traffic / population
1.	Agartala	NER	125	0.5478
2.	Goa	W	109	4.4499
3.	Kolkata (Calcutta)	E	105	0.0782
4.	Mumbai (Bombay)	W	95	0.2140
5.	Delhi	N	94	0.1986
6.	Imohal	NER	87	0.0253
7.	Silchar	NER	81	0.2042
8.	Aiiwal	NER	55	0.0709
9.	Guwahati	NER	54	0.2780
10.	Bhuvaneshwar	E	52	0.1128
11.	Baghdogra	E	50	3.1006
12.	Jorhat	NER	47	0.1014
13.	Dimapur	NER	46	0.1031
14.	Dibrugarh	NER	39	0.2802
15.	Patna	E	39	0.4827
16.	Ranchi	E	36	0.0311
17.	Raipur	E	32	0.0343

Forecasting traffic demand in the past has been by the use of econometric models driven by past data and including economic data like GDP, manufacturing indices, foreign tourist arrivals. New econometric models are now required to forecast traffic.

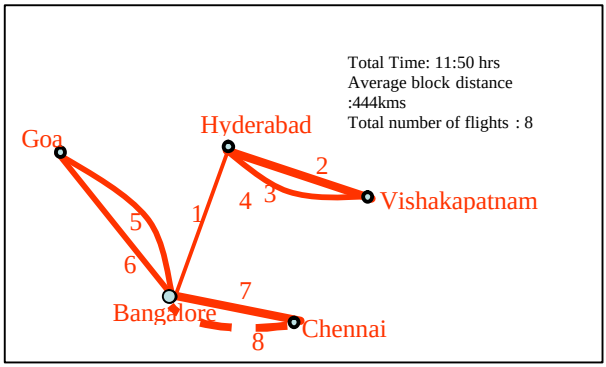
3.0 Networks

The present air map of India is consistent with the affluence and demographic spread in a broad sense. Airline networks in India have been driven mainly by the need to connect the major metros leading to one time public sector monopoly operator Indian Airlines to attempt an all jet fleet. However, social obligations to connect smaller markets like state capitals required smaller aircraft. As private carriers like Jet Airways and Air Sahara were primarily involved in competing for the Indian Airlines market in the early stages of the liberalisation process, the smaller towns were connected with aircraft like the B737 on hopping flights. With the use of ATR72 and CRJ by Jet Airways and Air Sahara respectively, route rationalisation occurred. With the advent of the low cost carrier like Air Deccan, new regional routes were made operational. The CRJ aircraft which are regional jets have traditionally been used on long thin routes, which are over 800-1000 kms, but do not justify larger aircraft. Fig. 4. shows typical deployment.



(a) (b)

Fig. 4. Typical networks : (a) A320/B737, (b) Regional jet



(c)

Fig. 4. (contd.) (c) Turboprop

4.0 Cost economics of operation

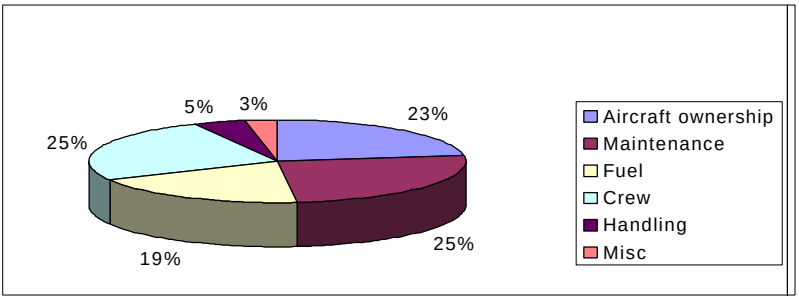


Fig. 5 Cost economics of operation in India

Cost economics of operation in India is driven by ownership costs (purchase or lease, depreciation, hull insurance etc), fuel costs and maintenance (Fig. 5). Historically business plans of airlines were affected by fuel and maintenance costs that changed over projected costs due to currency volatility. In recent years, however, due to the strength of the Indian currency, such serious problems are less likely to affect the operating economics. Nonetheless, the operating economics of any airline is very sensitive to cash flows and long term negative flows could endanger the airline as seen in the recent happenings at Air Deccan. Work at NAL earlier for a typical feeder operation shows the possible relation between profit before tax (PBT), load factors and ticket pricing (Fig. 6).

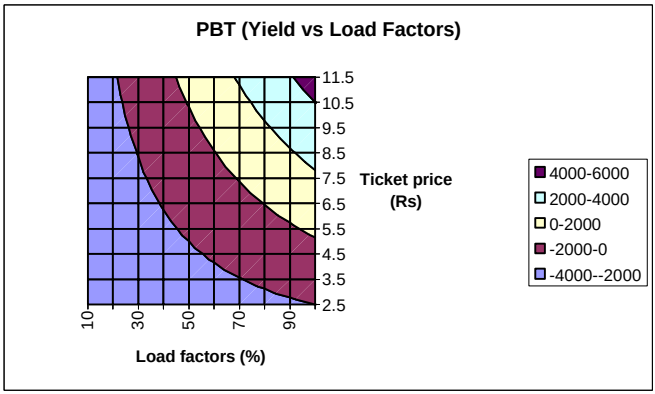


Fig. 6

5.0 Airline operation failures : case studies

Over the years, there have been a series of airline failures, especially in the last decade. Several studies were carried out at NAL including the failure of Vayudoot, Gujarat Airways. Failures of airlines like East West, Damiana, NEPC, ModiLuft were also studied. While the market situation after 2003 is radically different, the reasons for the failures between 1993-2000 were due to the harsh regulatory regime and management failure. For example, as shown in Fig. 7, Gujarat Airways at the time of its closure had expanded rapidly, serving destinations in South India with commuter aircraft, while it had a logistic and maintenance base in the West. Ticket pricing issues, lack of reliability etc drove many of the failures. Interestingly, the airlines that commenced operation after the Government deregulation and lowering the taxes after 2003 have had been better placed with improvement in demand based on rising income levels, favourable currency movement, manufacturers providing power by the hour/maintenance by the hour type of maintenance structures, where low cost airlines need not invest in MRO infrastructure. Nonetheless, the present difficulties, especially at the low cost carrier, Air Deccan shows that rapid expansion, poor training, poor scheduling etc can drive airlines into economic failure. Summary lessons from our work shows that operators with a handle on technology, management and consumers would essentially survive. It must be pointed out the problems at Air Deccan shows that superior management at SouthWest and Ryan Air were drivers

for success, not just the belief that traffic can be generated just by pricing alone and could mean success if the airline held out longer.

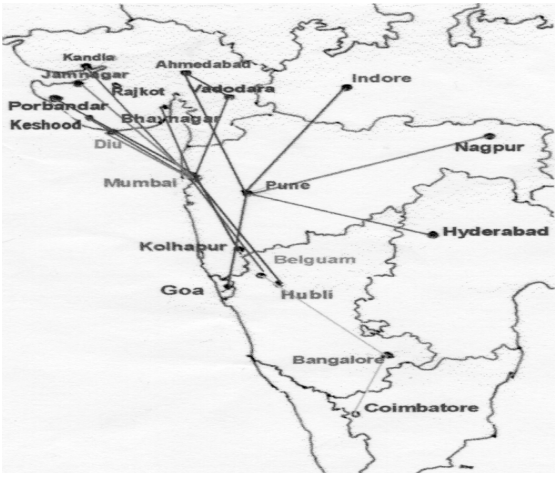


Fig. 7.

6.0 New forecasts

Based on the work done earlier, examination of city pair data, econometric models and the possibility of sustained GDP growth of over 7% led to market forecasts shown in Table 2. Interestingly, these forecasts are in line with those being projected by Boeing and Airbus. However, conservative estimates have been made for regional aircraft, though with route rationalisation and increasing competition, it is possible that the market forecasts for regional aircraft will increase as Tier II and Tier III cities develop.

Table 2

Year	*Total fleet*	*Narrow body*	*Wide body*	*Regional*	*Cargo*
2006	267	150	50	50	17
2007	321	180	60	60	21
2008	374	210	70	70	24
2009	428	240	80	80	28
2010	481	270	90	90	31
2011	535	300	100	100	35
2012	568	330	110	110	38
2013	642	360	120	120	42
2014	695	390	130	130	45
2015	749	420	140	140	49
2016	802	450	150	150	52
2017	856	480	160	160	56
2018	916	516	170	170	60
2019	963	540	180	180	63
2020	1017	570	190	190	67

7.0 Discussion

As mentioned earlier, the Indian civil aviation scenario has seen a major transformation. Aircraft purchases by Indian operators will be among the highest in the world and is regarded as one of the world's fastest growing markets. However, structural weaknesses in the industry are due to lack of vertical integration, congestion and poor infrastructure at airports. It is expected that these will be addressed soon in a variety of forms, including building of new airports. The regulatory regime has generally become more investor friendly. However, the industry suffers from a lack of vertical integration, especially with regard to local manufacture of aircraft, components and assemblies as well as maintenance, repair and overhaul.

It was also found during the course of these studies that while large scale technological advances were occurring on large aircraft, technology absorption for regional aircraft was much poorer as shown in Fig. 8.

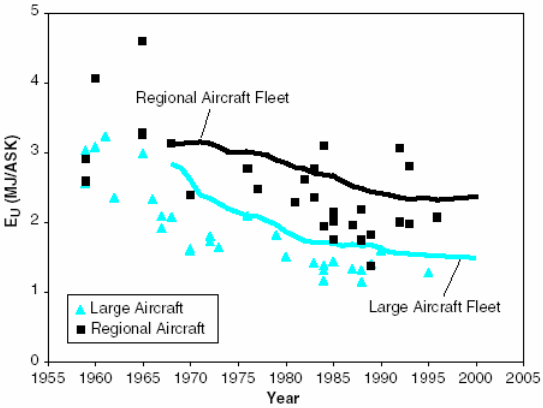


Fig. 8. (From Raffi Babikian, Stephen P. Lukachko and Ian A. Waitz, Department of Aeronautics and Astronautics, Massachusetts Institute of Technology, where Eu is the energy per ASK))

Thus, it appears appropriate that focus to develop regional aircraft that is integrated with new technologies can provide further rationalization to the Indian civil aviation structure and generate economic multipliers as new towns and cities get opened up with more efficient aircraft.

8.0 Acknowledgements

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